a is a nerve-fibre which was followed over more than twenty elementary muscular fibres from a dark-bordered fibre. One of the subdivisions of this fibre is seen at *f*, where it again runs with a very fine dark-bordered fibre (*o*). The dark-bordered fibre (*o*) was some distance higher up in the specimen, but its place has been altered in order to avoid the necessity for a still larger drawing. Above *b* a nucleus of a very fine nerve-fibre is seen. Such nuclei lie upon the surface of the muscular fibres, external to the sarcolemma. The nucleus often *appears* as if it were within the sarcolemma (*c*), but the fibres proceeding from each extremity render such a position impossible. The relation of these nerve-nuclei to the sarcolemma is seen at *l* in profile. The nuclei, as well as the fibres for a certain distance, often adhere to the sarcolemma very firmly; but in the thin mylo-hyoid muscle the course of the fibres over or under, but always *external* to the muscular fibres, may be readily traced if the muscular fibres be separated slightly from each other, as represented in the drawing.

At *d* fine nerve-fibres accompanying the fine fibre continued from the dark-bordered fibre, as described in the 'Philosophical Transactions' for 1862, are represented. Such fibres are also seen at *e* and *f*.

m, *n*, and *o* dark-bordered fibres, with nuclei near their distribution. *m* would probably pass over sixty or seventy muscular fibres, and *n* over perhaps twenty, before it divided into fibres as fine as those seen at *b*, *e*, *f*, *l*.

p a very fine capillary vessel with a nerve-fibre running close to it.

q a bundle composed of six very fine nerve-fibres near their distribution. These fibres exhibit a very distinctly beaded appearance, which is also observed in many other fine fibres in different parts of the specimen.

Traces of connective tissue are seen in all parts near the fine nerve-fibres and around the muscular fibres. Here and there some very fine connective tissue-fibres, which were not altered by acetic acid, are represented. These represent the remains of fine nerve-fibres, which existed in a state of functional activity at an earlier period.

The drawing, with the exception of the position of the nerve-fibre (*o*) above mentioned, is an actual copy from nature. The relative position of the muscular fibres, the form and general characters of the so-called nuclei, and the position and size of the nerve-fibres and their nuclei have been carefully preserved.

I have traced the very fine nerve-fibres in so many instances from one trunk to another ramifying at a very considerable distance, that I cannot believe any true terminations or ends exist.

XVI. "Note on the Minute Structure of the Grey Matter of the Convolutions of the Brain of Man, the Sheep, Cat, and Dog." By Lionel S. Beale, M.B., F.R.S., &c. Received June 18, 1863.

By a new process of investigation, I have succeeded in demonstrating the connexion between the nerve-cells and fibres in the grey matter of the convolutions and in other parts of the mammalian brain, and have followed individual fibres for a much greater distance

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than can be effected in sections prepared by other processes of investigation which I have tried. In many instances one thick fibre is continuous with one or other extremity of the "cell," while from its opposite portion from three to six or eight thinner fibres diverge in a direction onwards and outwards. This arrangement is particularly distinct in the grey matter of the sheep's brain. The broad extremities of the cells for the most part are directed *towards* the white matter of the hemisphere. The cells have no cell-wall; and the matter of which the fibre is composed is continuous with that of which the outer part of the "cell" consists.

The so-called "granular matter," or "granular matrix," which is described as existing in considerable quantity in the grey matter around the cells and between the fibres, results, I think from the disintegration of the finest nerve-fibres and cells; for in the specimens I have prepared, the tissue intervening between the cells is seen to be composed *entirely of nerve-fibres.* The majority of these fibres are not more than the $\frac{1}{100,000}$th of an inch in diameter; and many fibres, whose continuity with cells can be demonstrated, are as fine as this at a distance of not more than $\frac{1}{1000}$th of an inch from their origin. The slightest displacement of the thin glass covering the specimen will often destroy these delicate fibres, and nothing but amorphous granular matter results. The apparently free nuclei in the more superficial part of the grey matter are really the nuclei of cells, *with every one of which fibres are in connexion.* There are no cells with less than two fibres in continuity with them. In the brain of a young animal it is easy to find many cells connected together by broad bands of fibres, which vary much in length and thickness; but in the adult a positive connexion between two *contiguous* cells can be demonstrated only here and there. As the cells separate further and further from each other, the fibre becomes so thin and long, and it changes the plane in which it ramifies to such an extent, that it cannot often be traced for any great distance.

The fibres are formed as the cells, originally continuous, become separated further and further from each other. In all parts of the nervous system the so-called "cells" (often termed "nuclei" in peripheral parts) are structurally continuous with each other through the fibres.

The fibres are not offsets or outgrowths which grow centrifugally from different adjacent cells and then join or anastomose with one another, but they result, on the other hand, from the moving away from each other of cells which were originally continuous; so that a very thin fibre of $\frac{1}{100,000}$th of an inch in diameter, and perhaps three or four thousandths of an inch in length, represents the broader and shorter bands or cords of communication which existed at an earlier period of development, when the cells were much closer together.

It has been stated that nerve-cells do not exist in the white matter; but numerous cells are present in this tissue for the distance of perhaps the sixth of an inch or more beneath the grey matter. I do not propose now to enter into detail; the arrangement of the cells and fibres will be accurately represented in drawings; for it is not possible for me to convey an accurate idea of the structure of this elaborate tissue by description. I may be permitted to offer the following general conclusions resulting from observations upon the grey matter of the convolutions of man, the sheep, cat, and dog.

1. The numerous nerve-cells of the grey matter are *all* connected or give origin to at least two fibres.

2. These fibres, wide near their origin, gradually diminish in thickness until they are not more than the $\frac{1}{100,000}$th of an inch in diameter.

3. The granular matter said to be so abundant in the grey matter consists of fine and very delicate nerve-fibres, which are easily broken down when thin sections of this soft tissue are submitted to microscopical examination without special preparation.

4. It is probable that the cells of the grey matter of the convolutions are connected together; but in the adult the cells are not often connected with those cells which are situated *nearest* to them.

5. There is no reason for supposing that the nerve-cells, here or elsewhere, influence any nerve-fibres save those *which are structurally continuous with them.*